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THE INFLUENCE OF EMPLOYMENT UPON THE FERTILITY OF WOMEN

The employment of married women is usually accompanied by lower birthrates and the babies of working mothers die more frequently than do those of housewives. These are, apparently, the most serious social consequences of the ever-increasing number of women engaged in industrial and professional pursuits, according to the very excellent British report on the fertility of marriage.*

Although there are no analogous figures for the United States, there are already many indications that similar conditions prevail here. Such findings gather additional significance because of the large number of women gainfully employed in this country. United States Census figures show that in 1880, there were only 2,500,000 occupied women; in 1900, the number had more than doubled; in 1920, there were over 8,500,000, of whom almost two million were married. Nine per cent. of all married women, 15 years of age and over, were gainfully employed in 1920, as against 4.6 per cent. in 1890. If subsequent investigation should actually show that what has definitely happened in England has occurred here on an equally large scale, we shall have to give serious consideration to the price we pay as a nation for the added satisfaction and increased economic well-being which women obtain as a result of their work.

Various attempts have been made here and in England to measure the amount of infant mortality which can be traced to the occupation of the mother. Naturally, the entire excess in the infant deathrate where the mother is employed cannot be assigned to that one cause alone. In many cases, mothers are forced to work because of the low family income; and the consequent death of the child must be attributed to the accompanying evils of poverty, housing congestion,

*Report on the Fertility of Marriage, Volume XIII of the 1911 Census of England and Wales, published by His Majesty's Stationery Office, London, 1923.

unsanitary surroundings and bad nutrition—as well as to the employment of the mother. Such intricate economic and sociological factors cannot be disentangled one from another. Nevertheless, the employment of the mother is a responsible item in the unfavorable infant mortality picture. J. C. DUNLOP,* after comparing over 5,000 records of working mothers married less than 15 years with the same number of records of unoccupied mothers, found that 24.0 per cent. of the children of occupied mothers and only 14.8 per cent. of the children of unoccupied mothers were reported to be dead, an excess mortality of approximately 62 per cent. for the children of occupied mothers. A series of studies, made in different industrial centers by the Children's Bureau, on the relationship between economic factors and infant mortality in the United States showed that in every city but one, the mortality of babies whose mothers were gainfully employed during the year preceding the baby's birth exceeded that of infants whose mothers were not so employed. This was true wherever the mothers were employed. When the mothers were employed away from home, the infant mortality was higher than when the mothers worked at home.

The recent British study shows that child mortality depends on the amount of care which the child actually receives. Where the mother can obtain a reasonably adequate substitute, "the child suffers comparatively little, as in the case of post office officials, teachers, actresses, clerks, and shopkeepers generally; but in the more distinctly working class occupations, on the other hand, the loss of the mother's care frequently involves the death of the child, as in the case of printers, earthenware workers, leather goods makers, and textile workers."

Turning to the details of the British investigation regarding the fertility of employed women, we find that low fertility is almost universal among married working women of less than 45 years of age. The actual ratios of children born per 100 couples have been standardized to allow for the relatively short duration of marriage. The following occupations employing considerable numbers of women show unusually low percentages of children born; actresses, 43 per cent. of the average for the whole population of similar marital duration; artistic and scientific workers, 51 per cent.; teachers, 52 per cent.; domestic servants, 52 per cent.; musicians, 54 per cent.; clerks, 55 per cent.; local government officials, 60 per cent.; milliners, 63 per cent.; barmaids, 63 per cent.; and tobacconists, 65 per cent.;

*J. C. DUNLOP, The Fertility of Marriage in Scotland: A Census Study, Journal of the Royal Statistical Society, February, 1914, p.282.

important textile industries employing large numbers of women showed ratios from 59 to 75 per cent., with the exception of silk, lace and canvas manufactures and cotton spinners, where the number of children ran 77, 98, 96 and 82 per cent., respectively.

It would appear that in England the conditions of low fertility are often found in those occupations in which the largest number of married women are employed. In 1920, in the United States, there were 637,675 married women in "domestic and personal service," or about a third of all employed married women. The British Report shows that the number of children born to such women was only 52 per cent. of the average. The manufacturing and mechanical industries contain over 24 per cent. of all married workers in the United States. In England, fertility rates are fairly high for a few of these industries, which in this country employ over 50,000 women, such as cigar and tobacco manufactures, food, and shoes, but are quite low for other workers in this class, especially textile operatives, a very large group. In the United States, women in clerical and professional work are rapidly advancing in numbers. There was an increase amounting to 290 per cent. in the number of married clerical workers and a 62 per cent. increase among the married professional women gainfully employed in the period between 1910 and 1920. English experience shows very low fertility rates for both classes, the birthrate of women in clerical occupations being only 55 per cent. of the average. In respect to fertility, married professional workers stand near the bottom of the list.

Women already play an important rôle in the industrial and commercial life of the country. We may expect this to continue to an increasing degree with each successive decade. The employment of single women is now accepted without question. Some difficulties are encountered in fitting the married worker into our industrial scheme. Apparently, progress in industrial employment is being made at the expense of the married worker's rôle as a mother. We have as yet no true measure of the extent to which this conflict occurs. We obviously need more data as to the relative fertility of the different social classes; the age of marriage of employed women as compared with the unemployed; the number of children born to mothers of different occupations; and the number surviving; the length of time women stay in industry before and after marriage; the number of married women who seek employment only after their children have grown up; and what effect employment has on the morbidity and mortality rates of women. These and a host of other

questions should engross the attention of students of social phenomena. Only when we have this added information shall we really be able to organize the employment of married women on a basis which will not seriously endanger the future life of the community.

POPULATION GROWTH BY CONSERVATION

Under this apt title, *The New York Times* has commented upon the recent trend in American birthrates and deathrates, as related to immigration. It is pointed out that, since immigration has been materially reduced, and inasmuch as the birthrate persists in declining, we shall be forced to rely, for continued growth, if not indeed for protection from actual decline, upon a parallel fall in our deathrates. A marked fall has actually taken place and we may take satisfaction in noting its extent, from 17.6 deaths per thousand in 1900 to 11.9 per thousand per annum in 1924.

But as to the future? If the birthrate continues to decline, what are the prospects for the further growth of our population? There are some optimists who are sanguine enough to expect an unbroken continuation in the present fall in the deathrate; who believe that the average length of life of man will go on increasing indefinitely, or at any rate for a very long time to come. The more sober statistician, however, must take a less sanguine view, and anticipate that there is a major limit, inherent in the nature of man, beyond which even the best of hygiene and public health management cannot be expected, in the present stage of our evolution, to extend our average duration of life. The question then arises, how far can the birthrate safely be allowed to fall without bringing about a retrogression in our numbers, immigration, of course, aside. The answer is found in the following reflection:

Today, the mean of length of life of a woman is about 59.6 years (1924). This means that, in a stationary population, the individual must be replaced, on an average, once in 59.6 years. Or, putting it in another way, $\frac{1}{59.6} = .01678$ of the entire female population, must be replaced by births each year. Thus the equilibrium birthrate is the reciprocal of the mean length of life, in this case $\frac{1}{59.6} = 16.78$ daughters per thousand females per annum. Since there are 106 boys born for every 100 girls, the number of children born per 1,000 females is $16.78 \times 2.06 = 34.6$. Of perhaps greater interest than this gross birthrate, figured on the basis of the entire female population, is the birth-

rate per 1,000 females of childbearing age. In a stationary population, according to the mortality conditions of 1924, there would be 42.5 per cent. of the female population comprised within this age group. On this basis, we find $\frac{16.8}{.425}=39.4$ daughters or 81.2 children per 1,000 females of childbearing age per annum, required to maintain a stationary population. The rate actually prevailing may be found as follows: The birthrate observed in 1924 was 22.5 children per 1,000 persons. The ratio of males to females in the population is about 51 to 49. Hence the number of children born per 1,000 females is $\frac{22.5}{.49}=45.9$. And, finally, since the actual proportion of females of ages 15 to 44 is 47.6 per cent., we have, for the number of children born per annum per 1,000 females of childbearing age, the figure $\frac{45.9}{.476}=96.5$, thus giving a margin of safety of 15.3 children per 1,000 females of childbearing age. A similar computation carried out for the year 1920 shows an equilibrium birthrate of 84.4 and an observed birthrate of 101.7 children per 1,000 females of childbearing ages, thus leaving a margin of 17.3 children. There has, therefore, been a reduction of 2.0 children from 1920 to 1924 in this margin of safety. At this rate of decline, it would not take many years to arrive at a stationary population.

BUILDING THE HUMAN MACHINE

The Cost of Spoilage, Interest on Capital Invested, etc.

In the introductory article of this series, which appeared in the November, 1925, issue of the BULLETIN, we particularly drew attention to the fact that value is a relative concept, and that in discussing the value of a man it becomes necessary to indicate the person or persons relative to whom the value is to be reckoned. In the articles which have appeared so far we have had in mind principally the cost of a child to its parents. We have shown that in the typical family, with an income of approximately $2,500 per annum, it will cost *the parents* an average of $7,238 to bring a child into the world and raise it to age eighteen. But if we look at the matter from the standpoint of *the community*, certain additional costs also have to be considered, owing to the fact that not all children born survive. There is the very important item of *spoilage* to consider. In order actually to raise 88,264 children to age eighteen, the community must bear the cost of the birth and partial rearing of a full complement of 100,000 children;

the other 11,736 have died before reaching their eighteenth birthday. The situation is analogous to that of the manufacturer, who, in figuring the cost of goods actually placed on the market, must include a charge for a certain percentage of goods which, for one reason or another, must be rejected at various stages of manufacture.

A computation carried out on the basis of the life table to ascertain the amount which must be charged for this item of mortality gives the sum of $185 up to age eighteen.

There is also another item to be considered. The process of building the human machine, considered as a "manufacturing process," is a slow one. Accordingly, the raw material, in this case the immature individual, remains locked up as inert capital for a period of, say, eighteen years, during which it bears no interest. Inasmuch as the money thus kept out of gainful use might have been put out at interest, we must count among the costs of the "manufacturing process" the interest on the money invested, compounded for such a period as elapses between the time of investment and the end of the "manufacturing period." A computation to cover this point, based again on the life table, showed that the additional cost to be added to our original figure of $7,238 to make proper allowance for interest charges at three and a half per cent. per annum, compounded annually, is $2,624. Thus the total expense, making the proper allowance for deaths and for interest on capital, is $10,047.

In the table on next page we present the figures of cost, per person surviving, up to each year of life (column 1), from birth to age eighteen. In three separate columns are then shown, first, the cost computed without allowance for losses by death (column 2). The next column (3) shows the additional cost on account of deaths only. Column (4) gives, similarly, the additional cost on account of interest; and, lastly, column (5) gives the total or gross cost to the community, per person surviving, up to each year of life.

It will be observed that the additional outlay required on account of mortality is comparatively small. The heavy burden is that of interest. The explanation of this is that the principal loss by deaths occurs at the very beginning of life, so that the expenditure upon the individuals thus lost is of brief duration, and therefore not much in excess of the cost of being born. On the other hand, the item of interest is cumulated for all survivors over a period of eighteen years, and, in the case of some of those that die, for periods ranging from zero to eighteen years. Even at the moderate rate of three and a half percent., with annual compounding, interest runs up materially.

Lastly, there is one item of no little importance, whose value in dollars and cents is exceedingly difficult to ascertain. We have considered throughout only the family's money income, placed at $2,500. This, in most cases, represents the father's earnings or salary. But to this must be added the value of personal services rendered by members

Cost of Bringing Up a Child

Table showing allowance to be made at each age, for loss by deaths and for interest on capital; figures relate to cost per person surviving to stated age

(1) Age	(2) Cost Exclusive of Deaths and Interest	(3) Allowance for Deaths	(4) Allowance for Interest	(5) Total or Gross Cost (2) + (3) + (4)
1	$ 491	$ 26	$ 14	$ 531
2	752	35	37	824
3	1,013	40	72	1,125
4	1,274	46	115	1,435
5	1,603	50	172	1,825
6	1,931	56	242	2,229
7	2,255	61	327	2,643
8	2,662	66	428	3,156
9	3,077	72	546	3,695
10	3,492	78	683	4,253
11	3,907	84	842	4,833
12	4,356	90	1,020	5,466
13	4,815	97	1,222	6,134
14	5,273	108	1,447	6,828
15	5,732	121	1,698	7,551
16	6,234	138	1,976	8,348
17	6,736	159	2,285	9,180
18	7,238	185	2,624	10,047

of the household. The father may contribute little in this way, since he is presumably busy elsewhere. But the mother, in the majority of cases, gives a full working day to home occupations of one kind or another. Of her effort a large share is spent on behalf of the children. Had we a pecuniary measure of the value of these personal services, we should naturally add a *pro rata* share of them in our estimate of the cost of raising a child. Unfortunately, such a measure is lacking, and we must be satisfied with having pointed out the facts.

LONGEVITY OF COLLEGE ATHLETES

In cooperation with the Presidents' Committee of Fifty on College Hygiene, the Metropolitan Life Insurance Company has begun an investigation into the effect of college athletics upon the life expectation of students who engage in them. Other organizations which are

participating are the American Students' Health Association, the National Collegiate Athletic Association, and the Society of Directors of Physical Education in Colleges. The subsequent life histories of from eight to ten thousand college athletes, more particularly "letter men," who were members of the class of 1905 and prior years will be studied. The sports to be covered are football, rowing, track, baseball, la crosse, cross-country, and hockey. Thus far, the following universities and colleges are participating in the inquiry: Yale, Princeton, Cornell, University of California, University of Michigan, University of Chicago, University of Pennsylvania, and Amherst. Other institutions are expected to participate, but the inquiry will necessarily be restricted, as the majority of colleges and universities did not have, as early as 1905, well organized athletic departments.

There has been considerable discussion, both within and without university circles, on the effect of college athletics upon life expectancy. Opinion differs widely, and it is indeed fortunate that the subject is now to be studied intensively and scientifically.

Dr. THOMAS A. STOREY, Director, Department of Hygiene, College of the City of New York, is Executive Secretary of the Presidents' Committee of Fifty and is sharing with Dr. L. I. DUBLIN, Statistician of the Metropolitan Life Insurance Company, in the direction of this investigation. Inquiries regarding this study and offers of cooperation from other University departments having records of their athletes available for study will be gladly received by either of the directors.

The Carnegie Foundation for the Advancement of Teaching is also interested in this project as a part of the Foundation's study of school, college and university athletics, in the United States.

HEALTH RECORD FOR APRIL, 1926

The deathrate for April (12.0 per 1,000 Industrial policyholders) was substantially the same as for March (12.1). Obviously, the seasonal decline which we expect at this time was not in evidence this year. The April deathrate increased sharply as compared with the figure for April, 1925 (10.3), the rise being equivalent to 16.5 per cent. This year's April deathrate, in fact, was the highest recorded for that month since the Company began to calculate its mortality for individual months.

As was the case in March, the high deathrate, in April, is chargeable to increased mortality from influenza and pneumonia. These two diseases account for 4,069 deaths—nearly one-fourth of the total from all causes combined for the month (17,290). The influenza deathrate

(91.3 per 100,000) was more than double last year's April figure (45.4), while pneumonia mortality rose approximately 40 per cent., as compared with April a year ago. It is evident, nevertheless, that the peak of the 1926 influenza outbreak has been passed. During the later April weeks, the influenza and pneumonia deaths declined appreciably, and a still further drop is shown for the early weeks of May.

Unusually high mortality from measles continues to prevail, and the April deathrate of 21.3 per 100,000 closely approaches that for March (21.5), which was the highest ever recorded for any month among Metropolitan Industrial policyholders. Whooping cough registered the very high deathrate of 15.4 per 100,000, an increase of 13.2 per cent. over the March rate of 13.6, and of 71.1 per cent. over the figure for April, 1925 (9.). The scarlet fever rate was low in April and does not differ much from last year's figure; and diphtheria shows a small decline over the previous month and a marked fall as compared with April, 1925.

The tuberculosis deathrate in April was 114.9 per 100,000, or substantially the same as the figure for March. While this is a very low deathrate as compared with the figures of a few years ago, it is, nevertheless, considerably higher than that for April of last year. It is a fact that during the remainder of 1926 the tuberculosis mortality record will have to be considerably better than was observed in the same period of 1925 if any appreciable gain over last year's final figure is to be shown. At the end of April, 1926, the cumulative deathrate for tuberculosis among Metropolitan Industrial policyholders was substantially the same as at that time last year. This suggests strongly that we shall have, this year, at least a marked slackening in the *rate of decline* which has been observed in recent years for tuberculosis.

The "degenerative" diseases (cerebral hemorrhage, Bright's disease, and organic heart disease) each recorded higher rates than for April, 1925. This is, largely, a reflex of this year's influenza outbreak, as unusual prevalence of influenza is invariably accompanied by higher rates for the chronic diseases.

Puerperal diseases, in April, showed improvement over the same month of 1925. This has happened each month this year, and is unusual, as we expect higher puerperal deathrates during the above-average prevalence of influenza.

Deaths from accidents showed a slight improvement over March and a marked improvement over April, 1925. Automobile fatalities were slightly lower than during April a year ago, although a marked seasonal increase was recorded, as compared with March of this year.

The general deathrate for the large cities of the United States in April was 16.6 per 1,000. This is lower than for the previous month (17.9), but much higher than for April, 1925 (14.4). More cases of malaria, poliomyelitis, measles, typhoid fever, and whooping cough, were reported in April than in March, with decreases in the incidence of diphtheria, influenza, scarlet fever, and smallpox. Comparison with April a year ago shows more sickness from influenza, malaria, poliomyelitis, measles, scarlet fever, and whooping cough, with less diphtheria, smallpox, and typhoid fever.

Measles increased in most of the states tabulated, although there were declines in several. The severe outbreak in Toledo referred to in last month's BULLETIN continued, and the disease assumed unusual prevalence in Hamilton County, Ohio, and in Philadelphia. In Winona, a small town in the Province of Ontario, it became necessary to close the schools because of measles and mumps.

Influenza was by no means so prevalent in April. The most severe outbreaks during the month were reported from Canadian cities: Glasgow, Alta.; New Castle and Moncton, N. B.; and Three Rivers, Quebec.

Diphtheria and scarlet fever were much less prevalent in April.

The smallpox situation also improved. In California, nevertheless, the situation has been quite serious. The health officials of Bakersfield and Kern County in that state, are conducting active campaigns for vaccination. Employees of several large oil companies and of a large light and power company, residing in Kern County, have been immunized against the disease and large numbers of other citizens have been vaccinated. In Melrose, a small place in Montana, several cases developed, and it is reported that all susceptible school children were vaccinated.

Among the important public health activities of the month the following may be mentioned. A nutrition and public health institute was conducted at Grand Rapids, Mich., under the auspices of the City Child Health Bureau. In Minnesota a record is to be kept of every child who is inoculated with toxin-antitoxin in accordance with a plan of the State Board of Health to stamp out diphtheria in that state.

The following table shows the mortality among Industrial policyholders for April, 1926; March, 1926; April, 1925; and for the year 1925.

METROPOLITAN LIFE INSURANCE COMPANY

Deathrates* per 100,000 for Principal Causes, Premium-paying Business in Industrial Department (Annual Basis)

MONTHS OF MARCH, 1926; APRIL, 1926, AND OF APRIL, 1925

CAUSES OF DEATH	RATE PER 100,000 LIVES EXPOSED*			
	Apr., 1926	Mar., 1926	Apr., 1925	Year 1925†
TOTAL—ALL CAUSES	1199.4	1210.6	1034.3	906.9
Typhoid fever	2.5	2.4	2.0	4.6
Measles	21.3	21.5	4.6	3.3
Scarlet fever	5.1	4.7	4.9	3.5
Whooping cough	15.4	13.6	9.0	7.7
Diphtheria	9.0	9.2	13.1	10.6
Influenza	91.3	76.1	45.4	21.9
Tuberculosis (all forms)	114.9	115.2	107.4	98.0
Tuberculosis of resp'y system	99.5	100.4	94.0	85.8
Cancer	77.1	77.1	71.4	70.5
Diabetes mellitus	20.1	21.6	16.4	15.2
Cerebral hemorrhage	61.3	68.4	57.7	53.5
Organic diseases of heart	171.8	174.3	141.1	126.6
Pneumonia (all forms)	191.0	194.0	136.6	86.5
Other respiratory diseases	19.6	18.8	17.2	13.3
Diarrhea and enteritis	17.8	16.9	17.8	36.6
Bright's disease (chronic nephritis)	82.6	91.8	77.6	69.8
Puerperal state	17.9	17.4	19.3	16.5
Suicides	7.6	7.0	7.3	6.9
Homicides	7.6	6.5	7.8	7.2
Other external causes (excluding suicides and homicides)	53.1	55.7	58.4	64.2
Traumatism by automobiles	13.5	9.6	13.9	16.5
All other causes	212.6	218.3	219.4	190.5

*All figures include infants insured under one year of age.
†Based on provisional estimate of lives exposed to risk in 1925.

Correspondence on the subjects discussed in these BULLETINS may be addressed to: The Editor.

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Metropolitan Life Insurance Company,
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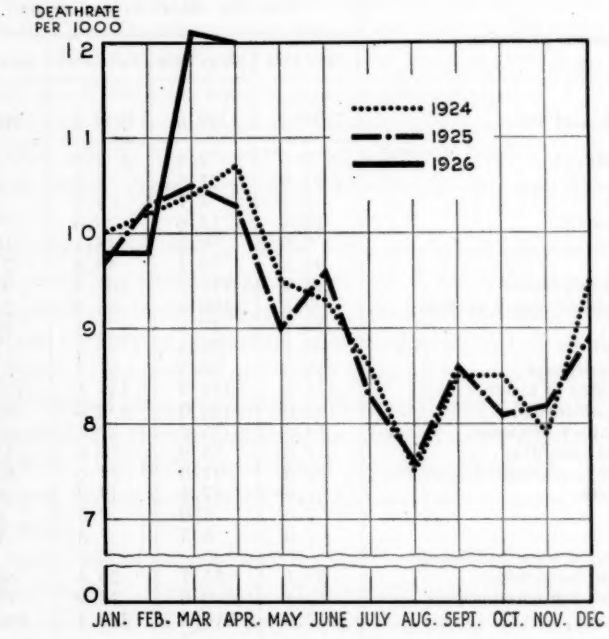
DEATHRATE PER 1000
in SPECIFIED MONTHS of
1924, 1925, 1926

METROPOLITAN LIFE INSURANCE COMPANY
INDUSTRIAL DEPARTMENT
(ANNUAL BASIS)



	1924	1925	1926		1924	1925	1926
JAN.	10.0	9.7	9.8	JULY	8.6	8.3	
FEB.	10.2	10.3	9.8	AUG.	7.5	7.6	
MAR.	10.4	10.5	12.1	SEPT.	8.5	8.6	
APR.	10.7	10.3	12.0	OCT.	8.5	8.1	
MAY	9.5	9.0		NOV	7.9	8.2	
JUNE	9.3	9.6		DEC	9.5	8.9	

NOTE Figures include mortality of infants under one year of age

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